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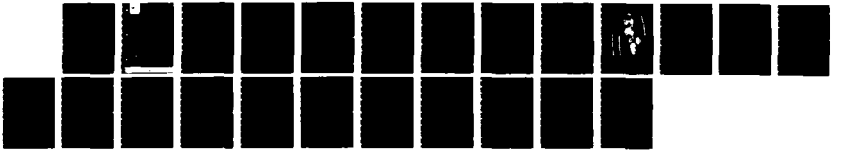

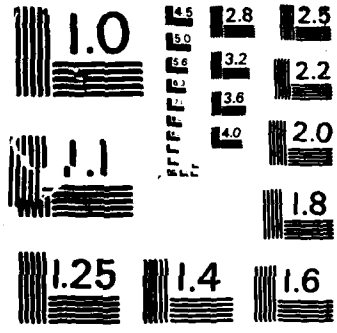

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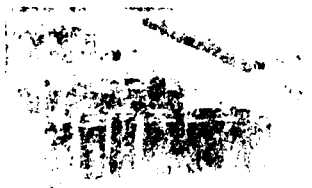

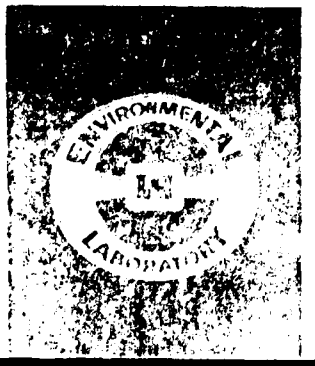

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ENVIRONMENTAL IMPACT RESEARCH PROGRAM

TECHNICAL REPORT EL-86-36

COMMON CHOKECHERRY (*Prunus virginiana*)

Section 7.5.4, US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL

by

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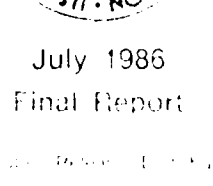

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A plant materials report on common chokecherry (*Prunus virginiana*) is provided as Section 7.5.4 of the US Army Corps of Engineers Wildlife Resources Management Manual. The report was prepared as a guide to assist the Corps District or project biologist with the selection, cultivation, and management of suitable plant materials for wildlife and habitat development programs. Major topics covered for chokecherry are description, distribution, habitat requirements, wildlife value, establishment, maintenance, and cautions and limitations.

Common chokecherry is a native deciduous shrub or small tree that occurs in subhumid regions of temperate and boreal North America. Chokecherry provides food and cover for a variety of wildlife species, and plants have been used successfully in revegetation and habitat development projects. The distribution and distinguishing characteristics of common chokecherry are described, and common varieties are noted. Soil, moisture, and shade
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requirements are specified, and common plant associates are listed for several regions. Benefits to wildlife, including nutritional value of plant parts, are discussed. Guidelines for establishing common chokecherry in habitat development projects include specifications for site selection, site preparation, propagule selection, and planting methods. Maintenance requirements and management cautions are noted.

PREFACE

This work was sponsored by the Office, Chief of Engineers (OCE), US Army, as part of the Environmental Impact Research Program (EIRP), Work Unit 31631, entitled Management of Corps Lands for Wildlife Resource Improvement. The Technical Monitors for the study were Dr. John Bushman and Mr. Earl Eiker, OCE, and Mr. Dave Mathis, Water Resources Support Center.

This report was prepared by Mr. Clinton H. Wasser, Professor Emeritus, Range Science Department, Colorado State University, Fort Collins, Colo.; Dr. Phillip L. Dittberner, US Fish and Wildlife Service, Western Energy and Land Use Team (WELUT), Fort Collins, Colo.; Dr. Donald R. Dietz, US Fish and Wildlife Service, Habitat Resources, Grand Junction, Colo.; and Dr. Wilma A. Mitchell, Wetlands and Terrestrial Habitat Group (WTHG), Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES). Mr. Chester O. Martin, Team Leader, Wildlife Resources Team, WTHG, was principal investigator for the work unit. The original report was prepared by WELUT under an Interagency Agreement with WES. Ms. Cathy Short and Ms. Pam Hutton, WELUT, assisted with manuscript preparation. Review and comments were provided by Mr. Martin, WES, and Mr. Larry E. Marcy, Texas A&M University.

The report was prepared under the general supervision of Dr. Hanley K. Smith, Chief, WTHG, EL; Dr. Conrad J. Kirby, Chief, Environmental Resources Division, EL; and Dr. John Harrison, Chief, EL. Dr. Roger T. Saucier, WES, was Program Manager, EIRP. The report was edited by Ms. Jessica S. Ruff of the WES Publications and Graphic Arts Division (PGAD). Drawings were prepared by Mr. David R. (Randy) Kleinman, Scientific Illustrations Section, PGAD, under the supervision of Mr. Aubrey W. Stephens, Jr.

COL Allen F. Grum, USA, was the previous Director of WES. COL Dwayne G. Lee, CE, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

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NOTE TO READER

This report is designated as Section 7.5.4 in Chapter 7 -- PLANT MATERIALS, Part 7.5 -- WOODY SPECIES, of the US ARMY CORPS OF ENGINEERS WILDLIFE RESOURCES MANAGEMENT MANUAL. Each section of the manual is published as a separate Technical Report but is designed for use as a unit of the manual. For best retrieval, this report should be filed according to section number within Chapter 7.

COMMON CHOKECHERRY *(Prunus virginiana)*

Section 7.5.4, US ARMY CORPS OF ENGINEERS
WILDLIFE RESOURCES MANAGEMENT MANUAL

Common chokecherry (Family Rosaceae) is a native deciduous shrub or small tree that grows in subhumid regions of temperate and boreal North America. Its thickets provide food and cover for many birds and mammals (Martin et al. 1951, Gill and Healy 1974, Dittberner and Olson 1983). Chokecherry is planted in windbreaks and shelterbelts (Johnson and Anderson 1980) and is used for revegetating depleted wildlife habitat and disturbed sites, such as roadcuts and surface-mined lands (Plummer et al. 1968, Plummer 1970, Thornburg 1982). This species serves as good watershed cover because its spreading rhizomes and prolific sprouts help to arrest soil erosion (Van Dersal 1939, Shaw and Cooper 1973, Vilkitis 1974).

DESCRIPTION

Common chokecherry grows from 5 to 30 ft (1.5 to 9 m) tall and forms thickets from an extensive rhizome system. Plants have numerous slender stems that branch loosely from the base of the trunk and form upright to spreading main branches (Harrington 1964). The bark of young trees is reddish-brown and contains prominent lenticels, whereas that of older trees is dark brown to

black and often furrowed and scaly (Stephens 1969) (Fig. 1). The root system is generally shallow with a few feeder roots.

Leaves are simple, alternate, elliptic to oval or obovate, abruptly pointed at the tips, 2.0 to 3.5 in. (5 to 9 cm) long, and 1 to 2 in. (2.5 to 5 cm) wide. The leaf margin is finely serrate; the upper leaf surface is dark green and lustrous; and the grooved leafstalk has 2 red glands near the base (Radford et al. 1968, Stephens 1969). Black cherry (*Prunus serotina*), a species similar in the shrub stage, has 3 to 4 glands.

The inflorescence is a dense, drooping raceme located at the end of a new stem with several leaves. Each flower has 5 small, rounded, white petals and contains both stamens and pistil (Radford et al. 1968, Stephens 1969). The glossy, purplish-black cherries hang in clusters 4 to 5 in. (10 to 13 cm) long, and each one contains an ovoid, stony seed (pit) that is water permeable and approximately 0.6 × 0.5 in. (15 × 13 mm) in size (Vines 1960, Grisez 1974, Johnson and Anderson 1980). Plants flower from spring through early summer, and fruits mature from late summer through early fall (Vines 1960, Radford et al. 1968, Wasser 1982).

The most common subspecies are black chokecherry (*Prunus virginiana melanocarpa*) and western chokecherry (*P. v. demissa*). Varieties occasionally used as ornamentals include amber chokecherry (*P. v. leucocarpa*), which has amber-colored fruit, and dwarf chokecherry (*P. v. nana*), which is widely distributed in cultivation (Vines 1960, Beetle 1970, Vilkitis 1974). Black chokecherry is most often used in revegetation projects.

DISTRIBUTION

Common chokecherry occurs widely in North America but is most abundant in cool temperate to lower boreal regions. Distribution is continuous throughout the northern part of the United States from Maine to the Pacific Northwest; however, the species occurs sporadically in the Southwest, southwestern California, Oklahoma, southern Kansas, and mountains of the Southeast (Little 1976) (Fig. 1). Chokecherry grows from sea level to an elevation of 9000 ft.

HABITAT REQUIREMENTS

Chokecherry grows in a variety of habitats, from mixed coniferous and deciduous forests to fairly dense chaparral-like shrublands. The species is common on disturbed and successional sites, such as old fields, fencerows,

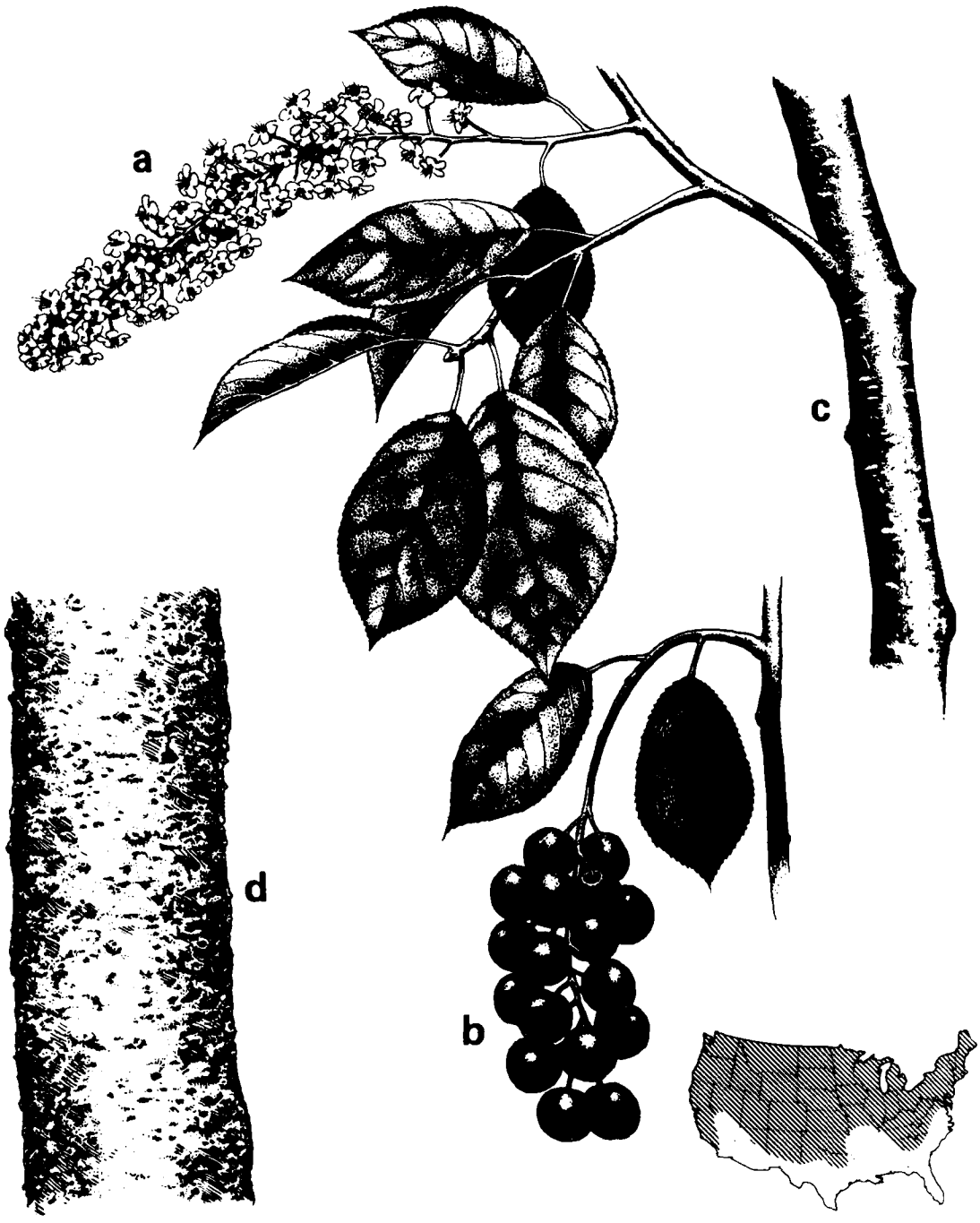

Figure 1. Distribution and distinguishing characteristics of common chokecherry (*Prunus virginiana*): (a) flowering branch and leaves, (b) fruit, (c) young stem with lenticels, and (d) older trunk with roughened bark

roadsides, forest edges, fieldcorner thickets, and ditchbanks. It is found in moist canyons, along riverbanks, and at swamp margins (Coastal Zone Resources Division 1978); and isolated dense colonies may grow in almost pure stands on marginally fertile soils, such as sand dunes and rocky hillsides (Vilkitis 1974).

Plants are most productive in full sunlight but can tolerate 75% shade (Coastal Zone Resources Division 1978). Vigorous stands occur in the partial shade of aspen (*Populus tremuloides*) and Gambel's oak (*Quercus gambelii*) but seldom in dense woods where the canopy is closed (Thilenius 1972). The species is cold tolerant and winter hardy. It can withstand grazing and will sprout vigorously after fire. Chokecherry is compatible with many woody deciduous plants but is strongly competitive with herbaceous vegetation (Wasser 1982).

Soils

Chokecherry is adapted to soils of all textures except dense clays (Thornburg 1982). It flourishes in deep, fertile, well-drained loams but is intolerant of poorly drained soils with high water tables (Shaw and Cooper 1973). Although optimum pH is from 6.0 to 8.0, chokecherry will tolerate soils that are moderately acidic (to pH 5.0) or basic (Vilkitis 1974). It will also grow on weakly saline soils (Wasser 1982).

Moisture

Chokecherry thrives in 16- to 30-in. mean annual precipitation zones but also occurs on sites that are periodically flooded or subirrigated in drier regions (Thornburg 1982). It grows abundantly in moist sites of semiarid areas and in open communities and disturbed moist sites of subhumid zones. Plants are intolerant of prolonged spring flooding, poor drainage, or a water table in the top 10 ft of soil (Shaw and Cooper 1973). This species is moderately drought resistant and survives dry periods by sprouting from persistent rhizomes (Wasser 1982).

Associated Species

Common forest associates of chokecherry are cottonwoods (*Populus* spp.), boxelder (*Acer negundo*), Rocky Mountain maple (*A. glabrum*), bigtooth maple (*A. grandidentatum*), serviceberries (*Amelanchier* spp.), pinyon (*Pinus edulis*), and ponderosa pine (*P. ponderosa*) (Wasser 1982). Chokecherry is associated with evergreens in most areas but is common only in upland deciduous habitats

in Minnesota (Kohn and Mooty 1971). In the northern Black Hills of South Dakota, it is a component of a tall shrub layer that includes serviceberry (*A. alnifolia*) and occasionally bur oak (*Q. macrocarpa*) and usually has an overstory of ponderosa pine (Thilenius 1972). In southeastern Montana, chokecherry is a common shrub associated with silver sagebrush (*Artemisia cana*) and wild plum (*Prunus americana*) in the snowberry - prairie rose (*Symphiocarpus albus - Rosa setigera*) vegetation type; this association also occurs in the more mesic coulees that dissect the ponderosa pine types at higher elevations (Batson and Elliott 1975).

WILDLIFE VALUE

Common chokecherry provides food and cover for a variety of wildlife species. Martin et al. (1951) stated that wild cherries are among the most important wildlife plants and that chokecherry is of outstanding value. At least 70 species of birds and 40 species of mammals are known to utilize parts of it (Van Dersal 1939, Martin et al. 1951, Kufeld 1973, Kufeld et al. 1973, Gill and Healy 1974, Hunt and Shaw 1979). Although forage values have been ascertained chiefly in the Western States, chokecherry is considered a valuable wildlife food in the Northeast (Vilkitis 1974), the Ozark Mountains (Crawford et al. 1969), and some parts of the South (Vogel 1981).

Food and Cover

Mammals. Mule deer (*Odocoileus hemionus*), white-tailed deer (*O. virginianus*), elk (*Cervus elaphus*), pronghorn (*Antilocapra americana*), and moose (*Alces alces*) feed on the twigs and foliage of chokecherry and use its thickets for cover (Pengelly 1961, Shaw and Cooper 1973, Gill and Healy 1974, Dittberner and Olson 1983). Chokecherry has been rated as good forage for deer and elk in the West, particularly in the Great Basin (Table 1). It is one of the most palatable shrubs on deer range in South Dakota and is a preferred species in white-tailed deer habitats of Minnesota (Dietz and Tigner 1968, Kohn and Mooty 1971). Dietz and Tigner (1968) found chokecherry to be the first shrub eliminated by intensive browsing in the Black Hills of South Dakota, and Shaw and Cooper (1973) reported destructive browsing in Montana. Seasonal use varies by region and generally occurs from spring through fall (Hill 1946, Martinka 1968, Dusek 1975); however, deer and elk in Montana also showed high preferences for it in winter (Shaw and Cooper 1973). Chokecherry

Table 1. Value of chokecherry to wildlife in 5 Western States (Dittberner and Olson 1983)

Species	Cover Value/Food Value*				
	Colorado	Montana	North Dakota	Utah	Wyoming
Elk	P/G	F/F	--/--	G/G	F/G
Mule deer	F/G	F/G	G/G	G/G	G/G
White-tailed deer	F/G	F/G	G/G	--/--	G/G
Pronghorn	--/--	F/F	G/G	P/P	P/F
Upland game birds	F/G	G/G	G/G	G/G	G/G
Waterfowl	--/--	--/--	--/--	P/P	P/P
Songbirds	G/G	G/G	G/G	G/G	G/G
Small mammals	G/G	G/G	--/--	G/G	G/G

* G = good, F = fair, P = poor, -- = no data.

receives minor use by bighorn sheep (*Ovis canadensis*) in winter and spring and is utilized by pronghorn chiefly in summer (Smith 1954, Cole and Wilkins 1958). Its forage value for pronghorn was rated good in North Dakota but only fair to poor in other Western States.

Chokecherry is a food source for the black bear (*Ursus americanus*), snowshoe hare (*Lepus americanus*), and cottontail rabbits (*Sylvilagus* spp.) (Gill and Healy 1974). It also provides good food and cover for many other species of small mammals.

Birds. Dittberner and Olson (1983) rated chokecherry as good forage for songbirds and upland game birds. Both groups consume the cherries, and game birds eat the buds (Martin et al. 1951). Davison (1967) rated the fruit a choice food for the following avian species: eastern bluebird (*Sialia sialis*), evening grosbeak (*Coccothraustes vespertinus*), rose-breasted grosbeak (*Pheucticus ludovicianus*), eastern kingbird (*Tyrannus tyrannus*), American robin (*Turdus migratorius*), wood thrush (*Hylocichla mustelina*), pileated woodpecker (*Dryocopus pileatus*), red-headed woodpecker (*Melanerpes erythrocephalus*), ruffed grouse (*Bonasa umbellus*), and sharp-tailed grouse (*Tympanuchus phasianellus*).

Nutrition

Studies have demonstrated high nutrient levels for chokecherry. It ranked high in crude protein and digestibility on ranges in Utah and Colorado and contained more protein than other important browse species in the Black Hills of South Dakota (Smith 1957, Dietz 1972, Welch 1981). Dietz (1972) also found high levels of calcium and phosphorus in chokecherry stems and leaves (Table 2). In the Black Hills study, the protein content of spring foliage approached the 25% value that Smith et al. (1975) reported necessary for optimum growth of white-tailed deer fawns, and the relative percentages of calcium and phosphorus fell within the range ascertained by Ullrey et al. (1975) as that required for optimum fawn growth and development in Michigan. Although chokecherry may contain higher nutrient levels than many other browse species, the low annual production per unit area usually prevents its being a major dietary item for deer.

ESTABLISHMENT

Site Selection

Only sites that provide the proper soil and moisture requirements should be selected for planting chokecherry. Choosing sites that have supported vigorous stands is especially important in the revegetation of depleted game ranges and disturbed watersheds (Brown and Martinsen 1959, Plummer et al. 1968, Bay 1976, Dietz et al. 1980). Chokecherry colonies can be planted to arrest headcuts in gullies and cutbanks but do not provide sufficient watershed cover for extensive areas. Consideration should also be given to sites that have potential use for shelterbelts or windbreaks in areas subject to wind erosion and snow deposition.

Small isolated thickets may be planted on cropped lands of the Great Plains to provide food and cover for birds, whereas larger areas may be utilized to accommodate big game mammals. Selected sites should be located away from primary roads and highway interchanges and should not be accessible to livestock. Snyder (1983) suggested that plantings in the Great Plains be located near supplemental water sources, such as windmills, tailwater ponds, and overflow areas.

Table 2. Seasonal nutrient content of chokecherry leaves and stems in the Black Hills of South Dakota (Dietz 1972)

Nutrient	Spring		Summer		Fall		Winter
	Leaves	Stems	Leaves	Stems	Leaves	Stems	Stems
Calcium(%)	1.1	0.9	1.8	1.5	2.3	1.7	1.9
Phosphorus(%)	0.5	0.4	0.4	0.2	0.4	0.2	0.2
Protein(%)	21.9	17.4	15.2	9.5	6.6	8.8	9.2

Site Preparation

Plot design. Chokecherry should be planted in a pattern that increases edge and interspersion of food and cover. Natural or developed clearings used for plantings should not exceed 2000 ft in width and 75 acres in total size for mule deer in pinyon-juniper stands (Reynolds 1966) or 330 ft in width and 5 acres in total size for white-tailed deer in northeastern mixed forests (McCaffrey and Creed 1969). Elongated plots that are placed on the contour and have irregular boundaries are preferred for wildlife management. To provide more effective wind control, shelterbelts and windbreaks can be planted in block arrangements rather than in narrow strips.

Mechanical treatment. Level, rock-free, farm-like tracts, such as meadows and abandoned fields, should be prepared for planting by first plowing and disking the site and then firming the seedbed by harrowing and dragging (Brown and Martinsen 1959, Snyder 1983). Large projects that require contour furrows and terraces can be treated with fire plows, contour trenchers, or Rocky Mountain trenchers (Larson 1980); on small areas, contour trenches can be dug with hand tools (Dietz et al. 1980). Transplant sites may be prepared with hand-dug holes or furrowed on the contour if accessible with equipment.

Vegetation that would compete with chokecherry plantings should be reduced on eroded hillsides in shrublands and brushlands. The following methods have been used successfully: (1) chaining or pipeharrowing before broadcasting seeds; (2) contour plowing on transplant sites; and (3) interseeding with scalper-interseeders (Stevens 1979). Roadcuts and gulleys used as planting sites should be leveled to a stable grade and provided with erosion-control structures; care should be taken to remove as little of the existing vegetation as possible.

Soil amendments. Soil samples from representative sites should be tested to determine fertilizer requirements. Application of nitrogen before planting encourages weed competition except on highly eroded sites and those with exposed subsoils. Erosive and severe southern and western exposures may require mulch to conserve moisture and lower surface temperatures. One or two tons of native grass hay per acre is usually recommended as mulching material. Livestock bedding is also suitable; it may contain manure but must be free of stock salt.

Propagule Selection

Either seeds or transplants can be used to establish chokecherry; however, establishment occurs more rapidly with transplants. A site can be stabilized in 3 to 5 years with transplants, whereas at least 10 years are required to develop stands from seeds. The time needed for plants to attain maturity varies considerably with site and climatic conditions.

Seeds. As there are no recognized cultivars of chokecherry, seed should be obtained from local or adjacent regions with similar environmental conditions. Seeds are usually well adapted if produced at elevations from 1000 ft below to 2000 ft above the planting site and within 300 miles north to 100 miles south of it. Although seeds may be available from commercial sources, seed firms will usually collect them on request. Information on collecting and processing seeds is given in Grisez (1974), Vories (1981), and Wasser (1982).

Good quality seed should test at 98% purity, 77% germination, and 73% pure live seed; and a pound should consist of 3000 to 8000 seeds (Grisez 1974). Unstratified seed require 60 days for 50% germination, but some seeds will need 120 days. Under laboratory conditions, stratified seed will germinate in 40 days if the temperature is alternated between 50° F at night and 77° F during the day. Seeds may be stratified by planting in late fall or by chilling in a moist medium such as sand, peat, or vermiculite for 120 to 160 days before spring planting (Dietz et al. 1980).

Seedlings show good vigor and establishment success on irrigated sites but only fair development on nonirrigated sites (Plummer et al. 1970, Dietz et al. 1980). Better vigor can be expected if improved seeds are used (Wasser 1982).

Transplants. Either nursery-grown or wild seedlings can be transplanted. Bare-root and container stock give equally good results in field plantings (Dietz et al. 1980), but bare-root stock is easier to handle. Successful establishment has been reported with 2-year-old seedlings in the West (Brown and Martinsen 1959) and 1-year-old stock in the East (Vogel 1981). Two-year-old seedlings used in Washington were 12 to 18 in. tall, a size that is easily handled yet visible during cultivation (Brown and Martinsen 1959). Wild seedlings may be as suitable as nursery stock for small revegetation projects and may be less expensive if obtained near the proposed planting site.

Planting Methods

Time of planting. Stratified seed is usually sown in early spring, whereas unstratified seed is sown in late fall before the soil freezes. Seedlings should be transplanted in early spring, as soon as equipment can reach planting sites (Brown and Martinsen 1959, Plummer et al. 1968, Plummer 1970, Dietz et al. 1980); however, transplanting in the fall may be feasible in areas with reliable moisture (Stevens 1979). Fall seeding is the more common practice on rangelands (Coastal Zone Resources Division 1978).

Seeding. Chokecherry seeds can be drilled in rows with a rangeland drill or scalper-seeder, such as the Hansen browse seeder. Broadcasting is more feasible for small projects and areas that cannot accommodate drills and scalpers; seeds can be broadcast by hand, cyclone seeder, mechanized ground seeder, or airplane.

For row planting the rate of seeding is approximately 25 seeds per linear foot (Coastal Zone Resources Division 1978). Recommended depths are 1/2 in. for seeds planted in the spring in firm, moist seedbeds and 1 in. for those planted in the fall or in loose seedbeds composed of coarser soils. Seeding recommendations for western rangelands are 1 to 2 lb of chokecherry seeds per acre in total mixtures of 10 to 30 lb per acre; seeds may be drilled or broadcast (Wasser 1982).

Transplanting. Suitable wild seedlings and rhizome sprouts are easily dug when the soil is wet. All bare-root stock can be kept moist by maintaining seedlings in sawdust until the time of planting and transporting them to the field in buckets of water. Seedlings should be planted the same depth at which they were growing in the field or nursery, and holes for planting should be large enough to avoid crowding the roots (Vogel 1981).

Chokecherry thickets 15 to 40 ft long can be established by planting seedlings in shallow furrows. The interspaces should be covered with 4-mil black plastic sheeting to prevent weed growth and concentrate precipitation around the seedlings. To maintain cooler soil temperatures, the plastic should be overlaid with mulch, such as wood chips or corn cobs. Without the plastic, survival is poorer and several annual weedings will be required (Snyder 1983).

Chokecherry seedlings used in windbreaks are usually planted in the outer rows, which should be spaced far enough apart to allow cultivation. Recommended spacing within each row is 4 to 6 ft, but seedlings will require closer spacing if the potential for survival is poor (Coastal Zone Resources Division 1978).

MAINTENANCE

Weeds can be controlled by mowing, cultivating, rototilling, or hoeing during the first 2 years of establishment and by herbicide application thereafter. Only herbicides approved by the state and the Environmental Protection Agency should be used, and fruit should not be sprayed. Cultivation of windbreaks and herbicide treatment or cultivation of thicket plantings are usually feasible and effective (Johnson and Anderson 1980, Snyder 1983).

Light irrigation is often necessary for successful establishment of chokecherry in regions receiving less than 20 in. mean annual precipitation (Brown and Martinsen 1959), and most windbreak plantings require supplemental water (Johnson and Anderson 1980). A hand-moved, solid-set sprinkler system is the most feasible and economical means of rangeland irrigation; one or two 1- to 3-acre-inch irrigations should suffice (Boesch 1982). Thickets placed near windmills, tailwater pits, or farm ponds can be watered by drip, centrifugal pump and sprinkler, or flood irrigation systems (Walker and Smith 1979, Synder 1983). If soils are deficient in nutrients, irrigated plantings will probably need periodic fertilization to sustain vigorous growth.

Chokecherry is tolerant of fire and will sprout new growth in 1 to 3 years following fire treatment; therefore, burning at 20-year intervals should maintain desirable plant composition in chokecherry stands. As succulent new growth is highly palatable to deer, young stands may benefit from the application of commercial deer repellents (Dietz and Tigner 1968).

CAUTIONS AND LIMITATIONS

Chokecherry is potentially poisonous to livestock because it produces hydrocyanic (prussic) acid. Concentrations are highest in seeds and young leaves (Dayton 1931), and acid formation is often associated with frost and drought stress. Although livestock poisoning is infrequent, thickets should not be planted on sites exposed to heavy grazing. The literature contains little information to indicate that hydrocyanic acid from chokecherry is a problem to wildlife.

Chokecherry is susceptible to diseases of drupe-bearing species, such as western X-disease, twisted leaf, and apricot ring pox; therefore, thickets should not be planted near peach and cherry orchards. Black knot, a fungal disease that reduces plant vigor, can be controlled by pruning the infected branches (Wasser 1982). Tent caterpillars frequently defoliate plants, and rodents can cause damage to seedlings planted on sites in forested areas or brushy rangelands.

LITERATURE CITED

Batson, F. T., and J. C. Elliott. 1975. Surface inventory of eastern Montana rangelands utilizing high altitude color infrared aerial photography. Fort Union Coal Field Symposium 5:651-622.

Bay, R. R. 1976. Some important native shrubs of the West. USDA For. Serv., Intermountain For. and Range Exp. Station. 16 pp.

Beetle, A. A. 1970. Recommended plant names. Univ. Wyo. Agric. Exp. Sta. Res. J. 31. 124 pp.

Boesch, B. E. 1982. Establishing range seedings by irrigation. Vegetative rehabilitation and equipment workshop. 36th Annu. Rep., USDA For. Serv., Missoula, Mont. Pages 18-19.

Brown, E. R., and C. F. Martinsen. 1959. Browse planting for big game. Wash. Game Dep. Biol. Bull. 12. 61 pp.

Coastal Zone Resources Division. 1978. Handbook for terrestrial wildlife habitat development on dredged material. U.S. Army Eng. Waterways Exp. Sta. Tech. Rep. D-78-37. 391 pp.

Cole, G. F., and B. T. Wilkins. 1958. The pronghorn antelope: Its range use and food habits in central Montana with special reference to wheat. Mont. Fish and Game Dep. Tech. Bull. 2. 39 pp.

Crawford, H. S., C. L. Kucera, and J. H. Ehrenreich. 1969. Ozark range and wildlife plants. U.S. Dep. Agric. Handb. 356. 236 pp.

Davison, V. E. 1967. Attracting Birds: From the Prairies to the Atlantic. Thomas Y. Crowell Co., New York. 252 pp.

Dayton, W. A. 1931. Important western browse plants. U.S. Dep. Agric. Misc. Publ. 101. 213 pp.

Dietz, D. R. 1972. Nutritive value of shrubs. Pages 289-302 In C. M. McKell, W. P. Blaisdell, and J. R. Goodin, eds. Wildland shrubs--their biology and utilization. USDA For. Serv. Gen. Tech. Rep. INT-1. 1494 pp.

_____, and J. R. Tigner. 1968. Evaluation of two mammal repellents applied to browse species in the Black Hills. J. Wildl. Manage. 32:109-114.

_____, D. W. Uresk, H. E. Messner, and L. C. McEwen. 1980. Establishment, survival, and growth of selected browse species in a ponderosa pine forest. USDA For. Serv. Res. Pap. RM-219. 11 pp.

Dittberner, P. L., and M. R. Olson. 1983. The plant information network (PIN) data base: Colorado, Montana, North Dakota, Utah, and Wyoming. U.S. Fish and Wildl. Serv. FWS/OBS-83/36. 786 pp.

Dusek, G. L. 1975. Range relations of mule deer and cattle in prairie habitat. J. Wildl. Manage. 39:605-616.

Gill, J. D., and W. M. Healy. 1974. Shrubs and vines for northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9.

Grisez, T. J. 1974. Prunus L. cherry, peach, plum. Pages 658-673 In C. S. Schopmeyer, tech. coord. Seeds of woody plants of the United States. U.S. Dep. Agric. Handb. 450. 883 pp.

Harrington, H. D. 1964. Manual of the Plants of Colorado. 2nd ed. Swallow Press, Inc., Chicago, Ill. 666 pp.

Hill, R. R. 1946. Palatability ratings of Black Hills plants for white-tailed deer. J. Wildl. Manage. 10:47-54.

Hunt, C. M., and S. P. Shaw. 1979. Superior wildlife plants for disturbed sites. Pages 119-122 In D. E. Samuel, J. R. Stauffer, C. H. Hocutt, and W. T. Mason, eds. Surface mining and fish/wildlife needs in the eastern United States. W. Va. Univ. and U.S. Fish and Wildl. Serv. FWS/OBS-78/81A. 125 pp.

Johnson, K. L., and E. S. Anderson. 1980. Conservation planting handbook for Wyoming and Colorado. Univ. Wyo. Agric. Ext. Serv., Laramie.

Kohn, B. E., and J. L. Mooty. 1971. Summer habitat of white-tailed deer in north-central Minnesota. J. Wildl. Manage. 35:476-487.

Kufeld, R. C. 1973. Foods eaten by the Rocky Mountain elk. J. Range Manage. 26:106-113.

_____, O. C. Wallmo, and C. Feddema. 1973. Foods of the Rocky Mountain mule deer. USDA For. Serv. Res. Pap. RM-111. 31 pp.

Larson, J. E. 1980. Revegetation equipment catalog. USDA For. Serv. Equipment Dev. Cent., Missoula, Mont. 198 pp.

Little, E. L., Jr. 1976. Atlas of United States trees. Vol III: Minor western hardwoods. USDA For. Serv. Maps 127 N and 127 NW.

Martin, A. C., H. S. Zim, and A. L. Nelson. 1951. American Wildlife and Plants. Dover Publ., Inc., New York. 500 pp.

Martinka, C. J. 1968. Habitat relationships of white-tailed and mule deer in northern Montana. J. Wildl. Manage. 32:558-565.

McCaffrey, K. R., and W. A. Creed. 1969. Significance of forest openings to deer in northern Wisconsin. Wis. Dep. Nat. Resour. Tech. Bull. 44. 104 pp.

Pengelly, W. L. 1961. Factors influencing production of white-tailed deer on the Couer d' Alene National Forest. USDA For. Serv., North. Reg., Missoula, Mont. 190 pp.

Plummer, A. P. 1970. Plants for revegetation of roadcuts and other disturbed or eroded areas. Range Improvement Notes 15:1-8.

_____, D. R. Christensen, and S. B. Monsen. 1968. Restoring big game range in Utah. Utah Div. Fish and Game Publ. 68-3, Salt Lake City. 183 pp.

_____, _____, R. Stevens, and K. R. Jorgensen. 1970. Highlights, results, and accomplishments of game range restoration studies. Utah Div. Fish and Game Publ. 70-3. 94 pp.

Radford, A. E., H. E. Ahles, and C. R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. Univ. of N.C. Press, Chapel Hill. 1183 pp.

Reynolds, H. G. 1966. Use of natural openings in a ponderosa pine forest of Arizona by deer, elk, and cattle. Rocky Mountain For. and Range Exp. Sta. Res. Note 78. 4 pp.

Shaw, A. F., and C. S. Cooper. 1973. The interagency forage, conservation, and wildlife handbook. Mont. State Univ. Ext. Serv., Bozeman. 205 pp.

Smith, A. D. 1957. Nutritive values of some browse plants in winter. J. Range Manage. 10:162-164.

Smith, D. L. 1954. The bighorn sheep in Idaho. Idaho Dep. Fish and Game Wildl. Bull. 1. 154 pp.

Smith, S. H., J. B. Holter, H. H. Hayes, and H. Silver. 1975. Protein requirement of white-tailed deer fawns. J. Wildl. Manage. 39:582-589.

Snyder, W. D. 1983. Shrub thicket establishment in Colorado high plains. Colo. Div. Wildl. Resour. Game Inf. Leafl. 108. 4 pp.

Stephens, H. A. 1969. Trees, Shrubs, and Woody Vines in Kansas. Regents Press of Kansas, Lawrence. 250 pp.

Stevens, R. 1979. Tree transplanter for transplanting shrubs into rangelands. Vegetative rehabilitation and equipment workshop. 33rd Annu. Rep., USDA For. Serv., Missoula, Mont.

Thilenius, J. F. 1972. Classification of deer habitat in the ponderosa pine forest of the Black Hills, South Dakota. USDA For. Serv. Res. Pap. RM-91. 28 pp.

Thornburg, A. A. 1982. Plant materials for use on surface mined lands in arid and semiarid regions. USDA Soil Conserv. Serv. SCS-TP-157; EPA-600/7-79-134. 88 pp.

Ullrey, D. E., W. G. Yonatt, H. E. Johnson, A. B. Cowan, L. D. Fay, R. L. Covert, W. T. Magee, and K. K. Keahey. 1975. Phosphorus requirements of weaned white-tailed deer fawns. J. Wildl. Manage. 39:590-595.

Van Dersal, W. R. 1939. Native woody plants of the United States. U.S. Dep. Agric. Misc. Publ. 303. 362 pp.

Vilkitis, J. R. 1974. Common chokecherry. Pages 23-25 In J. D. Gill and W. M. Healy, eds. Shrubs and vines for northeastern wildlife. USDA For. Serv. Gen. Tech. Rep. NE-9. 180 pp.

Vines, R. A. 1960. Trees, Shrubs, and Woody Vines of the Southwest. Univ. of Tex. Press, Austin. 1104 pp.

Vogel, W. G. 1981. A guide for revegetating coal mine soils in the Eastern United States. USDA For. Serv. Gen. Tech. Rep. NE-68. 190 pp.

Vories, K. C. 1981. Growing Colorado plants from seed: A state of the art. Vol I: Shrubs. USDA For. Serv. Gen. Tech. Rep. INT-103. 80 pp.

Walker, W. R., and S. W. Smith. 1979. Trickle irrigation for orchard crops. Colo. State Univ. Ext. Serv., Serv. Action Rep. 4.703 (rev.). 2 pp.

Wasser, C. H. 1982. Ecology and culture of selected species useful in revegetating disturbed lands in the West. U.S. Fish and Wildl. Serv. FWS/OBS-82/56. 347 pp.

Welch, B. L. 1981. Nutritive value of big sagebrush and other shrubs. Pages 9-22 In L. H. Stelter, E. J. DePuit, and S. A. Misko, tech. coords. Shrub establishment on disturbed and arid and semi-arid lands. Wyo. Dep. Game and Fish, Cheyenne. 154 pp.

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